

[blend] product being soluble in the combination of said first and said second organic solvents and miscible at the molecular level, said first and said second organic solvents being the same or different.

#### REMARKS

The courtesies extended by the Examiner to applicants' attorney during the telephone conference on July 1, 1996 is gratefully acknowledged. Prior to the conference, applicants had submitted a response to the Office Action which the Examiner was kind enough to discuss with applicants' attorney.

The Examiner stated during the conference that the proposed claim should be supported by a showing that applicants' product is different from the compositions disclosed in the prior art. In the Office Action dated April 15, 1996, the Examiner stated that the showing must contain ingredients and proportions of the prior art compositions if they are to be compared to the composition of the present invention.

As a result, one of the inventors has performed a series of experiments in which she obtained data that establishes conclusively that the composition of the present invention is different in kind rather than degree from the prior art compositions.

In the aforementioned Office Action, the Examiner rejected Claims 53-81 as being unpatentable over each of United States Patents 4,933,106 to Sakai et al., 4,940,517 to Wei, 5,068,060 to Jen et al. or 4,771,111 to Tieke et al. The references to Sakai et al., Wei et al., Jen et al., Tieke et al. or Li et al. alone or in combination, do not teach combining a polymer in undoped form in a solution with a dopant which is in another solution (of the same or different solvent), which are then mixed together to form a doped polymer in combined solution. The references noted teach polymerizing the undoped monomer to a polymer in a solution containing the dopant. After polymerization, the

resulting doped polymers resulting from each of the references are not soluble, but rather precipitate out of solution.

The inventor, Dr. Angelopoulos, who ran the experimental tests embodied in the enclosed declaration has been involved in the science and technology associated with conductivity of polymers for the past ten years. Her purpose was to establish that there is a difference in the structure between the blend of the present invention and the structure of the polymers disclosed in the prior art cited above.

The Examiner contends that the compositions of the present invention are obvious from the specific compounds disclosed in the prior art. Persons skilled in the art of conducting polymers, know that the processing of constituent polymers in the blend has a significant impact on the properties of the constituent polymers, including their solubility conductivity, optical properties, etc. As a result, polymers that possess identical nomenclature, in fact are different and have different properties.

To provide support for the assertion made above, applicants enclose an article authored by A. G. Mac Diarmid et al. who are disinterested third parties to this matter, in *Synth. Met.* **65**, 1994, pps. 103-116. A copy of this article is attached to the declaration as Exhibit A. These authors reported that a polyaniline doped with camphorsulfonic acid possesses dramatically different conductivities and optical properties when prepared in chloroform solvent as opposed to m-cresol solvent. The Mac Diarmid article supports applicants' position that chemical composition may appear to be the same, but the properties of these same compositions are substantially different based upon the molecular structure of same.

Based upon research by Dr. Angelopoulos, as stated in the declaration, it is the molecular structure that controls the properties of conducting polymers. Molecular

structure includes, but is not limited to, the chain conformation of the polymer, the interchain configuration and the polymer chain packing.

The common theme present in the prior art references cited by the Examiner to Sakai et al., Wei et al. and Tieke et al. is that they all teach the *in-situ* polymerization of monomers such as aniline, pyrrole, etc. in the presence of an electrolyte such as a polyacid.

The Wei et al. reference was selected as representative of the teachings of the prior art references noted above. The process described in Example 1 of the Wei et al. reference was duplicated using an addition polymerization process by polymerizing aniline monomer with ammonium peroxydisulfate in the presence of polystyrenesulfonic acid in aqueous solution.

Because the Examiner in the Office Action stated that with respect to a prior declaration submitted earlier by applicants, there was “no side by side comparisons between the closest prior art and the invention as instantly claimed to show superior properties of applicant’s invention as compared to the inventions of the prior art. ..there is no showing of ingredients and proportions of the prior art compositions and the results in comparison to applicant’s claimed composition,” applicants detailed the constituents and the proportions of same.

✓ Thus the declaration discloses that the process described by Wei et al. in Example 1 thereof was followed using an addition polymerization process by polymerizing aniline monomer with ammonium peroxydisulfate in the presence of polystyrenesulfonic acid in aqueous solution. To respond to the objection of the Examiner that the prior declaration was too general in its protocol, a stoichiometric amount of aniline was added to a 15% aqueous solution of polystyrenesulfonic acid wherein the molar ratio of aniline to polystyrenesulfonic acid is 1:1. Upon the addition of the oxidant, ammonium peroxydisulfate, a precipitate formed immediately. Attempts to dissolve the precipitate were unsuccessful.

Also following the method of Wei et al., Example 1, two additional polymerizations were conducted of: a) aniline monomer in the presence of ammonium peroxydisulfate and polyacrylic acid in aqueous solution; and b) aniline monomer in the presence of ammonium peroxydisulfate and polyamic acid in acetonitrile solution. In each case, a polymer was formed and once the polymer precipitated out of solution, it did not subsequently dissolve to any appreciable extent in an organic solvent.

To demonstrate the unexpected results obtained using the present invention teaching compared with prior art, an NMP solution of polyamic acid was formed. The solution of polyamic acid was prepared using the procedure described in Example 1 of the specification. A solution of the conducting polymer precursor (i.e. the polyaniline) was prepared in NMP. The dopant solution of the polyamic acid was added to the polyaniline solution with vigorous stirring. The polyamic acid dopes the polyaniline to the doped form resulting in a conducting polyamic-polyaniline blend in which the constituents remain in solution and do not precipitate out. At no time did the conducting polymer blend precipitate from solution. That is, the precursor polymer (the conducting polymer in undoped form) and the polyacid are both soluble in a given solvent. The reaction of the two is carried out in solution, and the product, which is the conducting polymer remains soluble in the given solvent. This result is clearly different from and unobvious in view of the prior art.

Unlike the results of the present invention, in each instance where the method of Wei et al. was followed, (as Wei et al. point out in their patent) polyaniline/polyacid precipitated out of solution. This result is significant and demonstrates a difference in kind since one of applicants' preferred embodiments uses polyamic acid. (See specification, page 23, Example 1.)

It has been determined experimentally (as set forth in the declaration) that the polymer resulting from the Wei et al. method cannot be dissolved because the Wei et al. polymer blend systems forms an interpenetrating system in which significant interchain interaction exists between polymer chains. By way of contrast, Applicants have eliminated the insolubility problem inherent in the prior art. Applicants attain a different conducting polymer structure using the same components but a different molecular structure.

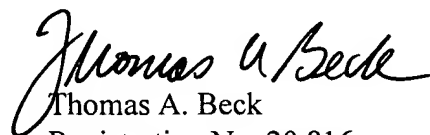
The structure of Applicants' blend is different from that of the *in-situ* polymerized blends described above. The products possess different properties. The prior art blends are insoluble, whereas Applicants' product is soluble.

In support of the assertions made above, analytical tests were conducted ✓ on the products resulting from the preparation procedures described above. **The conductivity of the *in-situ* products of Wei et al. as representative of the prior art was determined to be  $10^0$  S/cm whereas the conductivity of the instant invention wherein the polymer solutions were blended was  $10^{-3}$  S/cm.**

The arguments submitted in prior responses to the Examiner with respect to this case are hereby incorporated by reference herein.

In view of the modifications to the claims and based upon the arguments and declaration submitted herewith, allowance of the claims of the claims is respectfully requested.

Respectfully Submitted,



Thomas A. Beck  
Registration No. 20,816  
15 Alameda Place  
Mount Vernon, NY 10552  
(914) 668-3110

Date: August 15, 1996

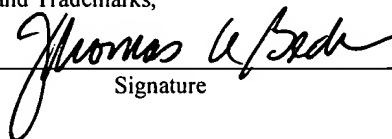
---

**MAILING CERTIFICATE**

Date of Deposit: August 15, 1996

I hereby certify that this amendment with fee  
is being deposited with the United States  
Postal Service under 37 CFR §1.10 on the date  
indicated above and is addressed to the  
Commissioner of Patents and Trademarks,  
Washington, D.C. 20231

Thomas A. Beck  
Person Mailing

  
\_\_\_\_\_  
Signature